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10/764,637

01/26/2004

Kae Hoon Lee

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09/27/2005

HANLEY, FLIGHT & ZIMMERMAN, LLC

20 N. WACKER DRIVE

SUITE 4220

CHICAGO, IL 60606

EXAMINER

LINDSAY JR, WALTER LEE

ART UNIT

PAPER NUMBER

2812

DATE MAILED: 09/27/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/764,637

Applicant(s)

LEE, KAE HOON

Examiner

Walter L. Lindsay, Jr.

Art Unit

2812

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-10 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-5 and 8-10 is/are rejected.
- 7) ☒ Claim(s) 6 and 7 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date ____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____.

DETAILED ACTION

This Office Action is in response to an Application filed on 1/26/2004.

Currently, claims 1-10 are pending.

Specification

1. The specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1 and 2 are rejected under 35 U.S.C. 102(b) as being anticipated by Gonzalez et al. (U.S. Patent No. 6,097,076 dated 8/1/2000).

Gonzalez shows the method as claimed by Figs. 2A-9A, and corresponding text as: forming a pad oxide layer (14) and a first nitride layer (16) on a semiconductor substrate (12) (col. 4, lines 62-col. 5, lines 2); forming a trench region (32) by etching the pad oxide layer and the first nitride layer (col. 5, lines 41-51); forming spacers (28) at the sidewalls of the etched first nitride layer (col. 5, lines 29-40); forming a first trench by etching the semiconductor substrate using the spacers and the etched first nitride layer as a mask (col. 5, lines 41-51); after forming a liner oxide layer (col. 6, lines 4-9) and an oxide layer filling the first trench (col. 6, lines 50-59), forming the device isolating

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barrier by flattening the liner oxide layer and the trench oxide layer to expose the etched first nitride layer (col. 7, lines 16-34) (claim 1). Gonzalez teaches that a thickness of the first nitride layer ranges from about 500 to 1000 Å (col. 5, lines 3-12) (claim 2).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. Claims 3-5 and 8-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gonzalez et al. (U.S. Patent No. 6,097,076 dated 8/1/2000) in view of Park (U.S. Patent No. 6,790,754 filed 12/29/2003).

Gonzalez shows the method substantially as claimed by Figs. 2A-9A, and corresponding text as: forming a pad oxide layer (14) and a first nitride layer (16) on a semiconductor substrate (12) (col. 4, lines 62-col. 5, lines 2); forming a trench region (32) by etching the pad oxide layer and the first nitride layer (col. 5, lines 41-51); forming spacers (28) at the sidewalls of the etched first nitride layer (col. 5, lines 29-40); forming

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a first trench by etching the semiconductor substrate using the spacers and the etched first nitride layer as a mask (col. 5, lines 41-51); after forming a liner oxide layer (col. 6, lines 4-9) and an oxide layer filling the first trench (col. 6, lines 50-59), forming the device isolating barrier by flattening the liner oxide layer and the trench oxide layer to expose the etched first nitride layer (col. 7, lines 16-34) (claim 3). Gonzalez teaches that a thickness of the first nitride layer ranges from about 500 to 1000 Å (col. 5, lines 3-12) (claim 4).

Gonzalez lacks anticipation only in not explicitly teaching that: 1) after forming a second nitride layer on top of the etched first nitride layer, forming a second trench by etching the second nitride layer and the etched first nitride layer; after a conducting layer is formed to fill the second trench, flattening the conducting layer to expose the second nitride layer; and forming the gate electrode by removing the second nitride layer and the etched first nitride layer (claim 3); 2) a thickness of the second nitride layer ranges from about 1000 to about 1500 Å (claim 5); 3) the conducting layer deposited to fill the second trench is formed through a LPCVD process at about 550 to about 650°C (claim 8); 4) a thickness of the deposited conducting layer ranges from 2000 to 5000 Å (claim 9) and 5) flattening the conducting layer comprises performing a chemical mechanical polishing process, and wherein a thickness of the nitride layer left after the flattening process ranges from about 10 to about 90% of a thickness of the nitride layer before the flattening (claim 10).

Given the teaching of the references, it would have been obvious to determine the optimum thickness, temperature as well as condition of delivery of the layers

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involved. See *In re Aller*, Lacey and Hall (10 USPQ 233-237) It is not inventive to discover optimum or workable ranges by routine experimentation. Note that the specification contains no disclosure of either the critical nature of the claimed ranges or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. *In re Woodruff*, 919 f.2d 1575,1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Park teaches the manufacturing of a semiconductor device. Park shows a process of forming isolation trenches (A) within a substrate (100) by using two nitride layers (104 and 108)(col. 2, lines 13-19). Park then shows a second trench formation (B) that is use in forming a gate electrode (122) (col. 2, lines 30-36). The nitride layers are then etched away (col. 2, lines 54-61). This process helps to combat short channel effects such as a threshold voltage decreasing due to the shorter length between a source and drain (col. 1, lines 39-45).

It would have been obvious to one of ordinary skill in the art at the time the invention was made, to modify Gonzalez by utilizing a second nitride layer in the formation of a gate electrode as taught by Park, with the motivation that Park teaches a method to combat short channel effects such as a threshold voltage decreasing due to the shorter length between a source and drain.

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Allowable Subject Matter

7. Claims 6 and 7 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Walter L. Lindsay, Jr. whose telephone number is (571) 272-1674. The examiner can normally be reached on Monday-Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael S. Lebentritt can be reached on (571) 272-1873. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Walter L. Lindsay, Jr.
Examiner
Art Unit 2812

WLL

September 23, 2005

